

# Software

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WYLBUR Edit Format Utility Package, January 1983

WYLBUR Wisdom, October 1987

WYLBUR Fundamentals Manual, October 1994

Batch Processing, October 1994

Document Formatting, October 1994

WYLBUR Command Procedures Manual, March 1995

Master Index, June 1995

WYLBUR General Editing Manual, 1995

WYLBUR Software

*Donated by Mr. Jay Vinton*

"Vast amounts of time, attention, and money are spent on the collection, preparation, and updating of text, including computer programs, letters, forms, lists, manuals and user guides, books, reports and proposals. In the computer field, a significant amount of effort is devoted to the clerical aspects of programming. Data entry consumes even more time and money than program preparation. Computers are ideally suited to assist in much of this text gathering and manipulation in an efficient and timely fashion, often at reduced cost," wrote Roger Fajman and John Borgelt in 1973.<sup>1</sup>

Beginning in 1967, . By 1969, the software was in use at both Stanford and the National Institutes of Health (NIH), where Fajman moved that year. At the NIH, the software would be tweaked, updated, and modified until finally discontinued 40 years later at the end of 2009.

WYLBUR was accessed via phone lines from computer terminals connected to the IBM mainframe computers at the NIH Division of Computer Research and Technology (DCRT). The terminals weren't desktop computers, which were in the future, but computers that users often shared with others, having to sign up for computer time. The advent of these remote terminals, however, allowed people who weren't computer specialists easy access to computer resources. Fajman and Borgelt designed WYLBUR for these noncomputer specialists so users would not be distracted from what they were working on to program a computer, too.

Features that we take for granted today had to be intentionally built into the WYLBUR software:

The DCRT 1968 Annual Report described in glowing terms the software that NIH users were just beginning to use before Fajman's 1969 arrival: "WYLBUR provides the user, in his home or office, the facility to create and edit source programs in real time, submit them for compilation and execution by the standard job stream processor, and retrieve the results of execution at his terminal. In addition, the user may work with arbitrary text material, libraries, and interrogate the system about the current status of the batch job stream. WYLBUR represents a significant move toward lowering the amount of non-programming overhead involved in the development of programs. With the job output available at the user's terminal, effective turnaround time is substantially lowered. In addition, the added ease of using a typewriter-like terminal instead of a keypunch contributes to more rapid development and debugging of programs."<sup>2</sup>

By 1971, WYLBUR had become a part of the everyday work of many scientific and administrative staff at the NIH. The number of telephone lines into WYLBUR was increased from 32 to 92, while the maximum number of users who could be simultaneously logged on was 86. The number of online file-storage disks needed grew from 16 to 22. Fajman and co-workers Jennifer Fajman and Leslie Barden had immediately begun working on improvements to WYLBUR when Fajman arrived at DCRT in 1969, and in 1971 they announced improvements, including:

- The FETCH, PRINT, and PURGE commands permitted users to easily inspect job output at the terminal.
- Options on the RUN command and a new ROUTE command permitted users to get the output from WYLBUR jobs on remote high-speed printers so that they didn't have to come to the Computer Center for their results.
- Long production jobs could be submitted through WYLBUR.
- Users could control when, and in what order, their jobs were run.
- Multiple paging files permitted WYLBUR to use additional temporary storage space to support more users.

Training the NIH staff how to use WYLBUR moved into high gear in 1971, too, with courses being offered for both programmers and administrative personnel. As the DCRT FY 1970 Annual Report noted, "WYLBUR has also gained wide acceptance as a tool to aid in the preparation of memos, reports, and other documents. In addition, WYLBUR has been used for data collection and inquiry applications."<sup>3</sup>

DCRT's workload exploded. Job-sessions on the IBM System 370—which used WYLBUR—exceeded half a million per month for the first time in October 1980, and in March 1981 reached 544,248. During this decade of exponential growth, between 1971 and 1981, Fajman continued his modifications, resulting in the introduction of Extended WYLBUR. "The long-awaited new and greatly enhanced NIH version of WYLBUR became operational on January 8, 1981, for all users of the utility. An 11-week transition period, during which both old and new versions were available, proved to be exceptionally smooth; user reaction to the new features of this interactive, terminal-oriented facility was enthusiastic."<sup>4</sup> The Extended WYLBUR provided enhanced text-editing capabilities for NIH publications and research papers, and added tools such as grants guidance and summary statements at the request of the NIH Division of Research Grants. New command procedures enabled Extended WYLBUR users to automate repetitive work which increased productivity.

Although the WYLBUR software was useful for administrative personnel, research grants staff, and scientists compiling and editing reports, some NIH researchers had bigger ideas for the program. In 1971, Drs. Morrison Rogosa and Micah Krichevsky (National Institute of Dental Research), along with Dr. Rita R. Colwell (Georgetown University) called for the establishment of an international database for cultures and culture collections. Their envisioned database would include "historical, nomenclatural, classificatory, and epidemiological information for groups and clones of such microorganisms as bacteria, rickettsiae, chlamydiae, and viruses."<sup>5</sup> Computers could manage the flood of information produced by thousands of laboratories around the world, and provide database updates more quickly compared to printed catalogs, which were only updated once every 10 to 15 years. The team used WYLBUR for a questionnaire to update their own database and suggested using WYLBUR to create the new international database. Their calls, however, were merely prophetic. *Bergey's Manual of Systematic Bacteriology*, a leading index cited by the 1971 article, was re-published in 1974 after a 17-year span of hand updating. In 1986, Rogosa, Krichevsky, and Colwell co-authored the book *Coding Microbiological Data for Computers*, in which they were still calling for that computer database. *Bergey's Manual of Systematic Bacteriology* began publishing online in 2015.

Putting the microbiologists' call for using computers to compile a database into practice, Drs. Donald S. Young, D. W. Thomas, and R. B. Friedman from the NIH's Clinical Center's Clinical Pathology Department reported in 1972 that "A listing of approximately 10,000 effects of drugs on tests performed in clinical laboratories has been developed in a time-shared computer. The list contains a directory for matching proprietary and generic names of drugs and an explanation for the mode of action of the drug on each test. Each entry is supported by a bibliographical reference that contains the author names, and the title of the article and journal. It is possible to search for specific 'character strings' (word or words, number, etc.) to obtain all the effects of a particular drug, or all drugs that affect a particular test, or even to search for a specific explanation for an effect. The system is undergoing trial in the Department's own computer to permit of automatic correlation of the effects of drugs with laboratory data from patients in one hospital ward."<sup>6</sup> The database was designed using WYLBUR and their article presents WYLBUR line structure and entry examples. Young went on to edit the *Directory of Rare Analyses*, *Effects of Drugs on Clinical Laboratory Tests*, and *Effects of Disease on Clinical Laboratory Tests*. In 2004, he began *Young's Effects Online* with the American Association for Clinical Chemistry, which offers instant access to the effects of thousands of diseases, drugs, and herbal remedies on medical lab tests.

Another way that WYLBUR was used at NIH was in a 1976 collaboration between Gerald Stoner (DCRT) and Dr. John Irwin (NIH Environmental Services Branch) for the control of biohazards at NIH. "The first steps in a comprehensive program to control biological hazards are to determine the types of agents present in laboratories and to assess the degree of risk in handling them. For this purpose, the Ad Hoc Inter-Institute Technical Committee on Biohazards at the NIH prepared and sent a questionnaire to all scientific investigators. The investigators were asked to list microbial agents, cell cultures, animals, body fluids, allergens, nucleic acids, and other biological entities being used in their laboratories. In addition, the investigators were requested to list microbial agents according to risk categories set forth in 'Classification of Etiologic Agents on the Basis of Hazard' published by the Center[s] for Disease Control [and Prevention] (CDC) in Atlanta, Georgia. Data on the first three items were given priority because of (1) the risk of handling microbial agents; (2) the knowledge that tissue cultures may be contaminated; and (3) the fact that animals may harbor agents pathogenic for man. The answers to the questionnaire were computerized for storage and retrieval."<sup>7</sup> WYLBUR was their software choice.

Roger Fajman worked at DCRT until his retirement in 2002. As well as maintaining and improving WYLBUR, Fajman worked on other projects, such as designing the NIH Utility Network (NUnet), which connected more than 36 buildings on and off the NIH campus. By 1991, 60 networks were joined through this system.

Fajman's most lasting contribution, WYLBUR, outstayed him at the NIH by seven years. DCRT warned NIH staff in early 2009 that they would be retiring WYLBUR at the end of the year because it was too difficult to find computer specialists who knew how to fix problems with the 40-year old software. They assured users that WYLBUR's text-editing functions could be performed with desktop-computer tools, and that commercial products could handle WYLBUR's other functions. WYLBUR was finally put to rest at in [month] 2009.

The actual title of the 2015 edition is *Bergey's Manual of Systematics of Archaea and Bacteria*